

new isograft used. The use of too large a graft or increased skin tension over a part of the graft are two other contributing factors that play a big part in effecting a distortion in the cartilage grafts. This is obviated by using a smaller graft than needed under minimum of skin tension. If the defect is not corrected at the first procedure, additional cartilage is added after the covering skin has stretched.

IN CONCLUSION

- 1. The source of the refrigerated cartilage isografts is properly selected human material. This gives one an accessible, inexhaustible supply of spare parts for correcting contour defects and reconstructing the framework for facial appendages.
- 2. The cartilage supply is easily prepared and sterilized by denuding it of its perichondrium, and then placing it in a sterile container covered with one part 1-1000 aqueous merthiolate and four parts normal saline, which is kept constantly in the refrigerator.
- 3. The refrigerated cartilage isograft simplifies the operative procedures, and in my hands has entirely replaced the autogenous cartilage graft. It has been used to correct skull, facial, chin, nose and ear defects, total or partial, while also acting as the orbital floor to correct ptosis of the eyeball.

490 Post Street.

QUANTITATIVE METHODS IN DIAGNOSIS OF BRAIN TUMORS*

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THE nervous system is largely inaccessible to direct examination. In most cases even the x-ray is of little help without the preliminary injection of air or some other medium. Consequently, in making a clinical diagnosis, one depends almost entirely upon the abnormalities he may be able to detect during the neurologic examination. As Bazett¹ has pointed out, when the responses are simply observed and given an approximate value, the information gained is obviously much less dependable and significant than when the same responses are given an absolute value. This does not imply that the laboratory is expected to bear the burden of making a diagnosis but that, as scientific methods are introduced to aid our special senses smaller abnormalities will be detected, whereas now they are accepted as being entirely normal.

A brief case report is cited to illustrate this point.

REPORT OF CASE

A. C., a man of twenty-nine years, was seen in April, 1934. He had had convulsions since August, 1933, with no localizing data available. On admission, the neurologic examination revealed only a suspicious fullness of the physiologic cup in the right optic disc. Encephalogram (Figure 1) showed slight enlargement but no significant displacement of the ventricles. The right frontoparietal region was explored, but no tumor found. The man died of hyperthermia, temperature reaching 109.3 degrees by rectum, on July 15, 1934. At autopsy, a cystic astrocytoma was found in the left posterior frontal region (Figure 2).

* Read before the Section on Neuropsychiatry of the California Medical Association at the sixty-eighth annual session, Del Monte, May 1-4, 1939.

TABLE 1.—Neurologic Examination

Cranial nerves	Deep reflexes ×
1. Smell ×	Superficial reflexes ○
2. Fields —	Motor system
Fundi ○	Simple movement ×
Acuity —	Range of movement ×
3, 4, 6. Pupil:	Compound movement ×
Size ×	Tremor ×
Reaction ○	Postural fixation ×
Eye movements ×	Romberg ×
5. Sensory:	Rapidly alternating movements ×
Pain ×	Sensory system
Touch ×	Touch ×
Corneal reflex ○	Pain ×
Motor ○	Temperature ×
7. Sensory taste ×	Vibration ×
Motor ○	Position ×
8. Hearing —	Stereognosis ○
Vestibular function ×	Two-point discrimination —
9. Motor ○	Texture appreciation ×
Sensory ×	Mental status ×
10. Motor ○	
11. Motor ○	
12. Motor ○	

Table 1 contains the various points of interest in the neurologic examination. Following each part of the examination, a dash indicates that a quantitative test is already in general use. A cross indicates that a quantitative test has been devised. A circle indicates that our powers of observation and description must still suffice in recording this portion of the examination. It is proposed to review briefly those tests that are available, but are not in general use. For details the reader is referred to the more complete articles mentioned in the "References."

THE SENSE OF SMELL

Elsberg⁵ has developed a quantitative method and applied it extensively. In the test, only two substances are used—coffee and citral. Bottles containing these materials have two openings. Through one a measured amount of air is injected. By the other, when the stop-cock is released, a blast of odor is allowed to flow into the side of the nose being examined. The smallest amount of odor, in cubic centimeters, that can be identified is called the minimum identifiable odor, abbreviated as M. I. O.

When this has been determined a constant stream of odor is injected for thirty seconds, and by then the odor is not perceived, due to fatigue. The time is then measured until the minimal amount of odor is again identified. This affords a measure of the fatiguability of the olfactory pathways. The results are found to correlate best with tumors in the frontal or temporal regions. A tumor pressing on the olfactory tracts will cause an increase in the M. I. O., but no change in the fatiguability. A tumor in the frontal lobe will cause the fatiguability to be prolonged, but no change in the M. I. O.

In sixty-one cases of brain tumor examined by Elsberg,⁶ the correct side was indicated in 77 per cent and, of these, 80 per cent were localized in the correct lobe.

EYES

Pupils.—It is difficult to measure the pupil within one millimeter, but a simple camera with long bellows and ground glass allows a magnified image to be measured accurately.

Eye Movements.—An instrument, now available to study the eye movements while reading, makes

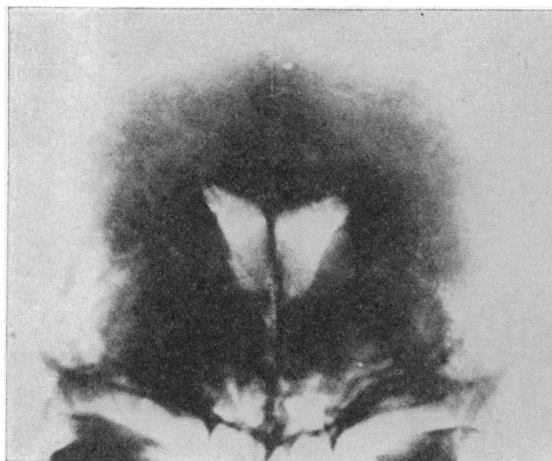


Fig. 1

Fig. 1 (Case 1).—Encephalogram shows ventricles slightly larger than normal. The body of the left lateral ventricle is slightly lower than the right. By measurement, there is no shift across the midline.

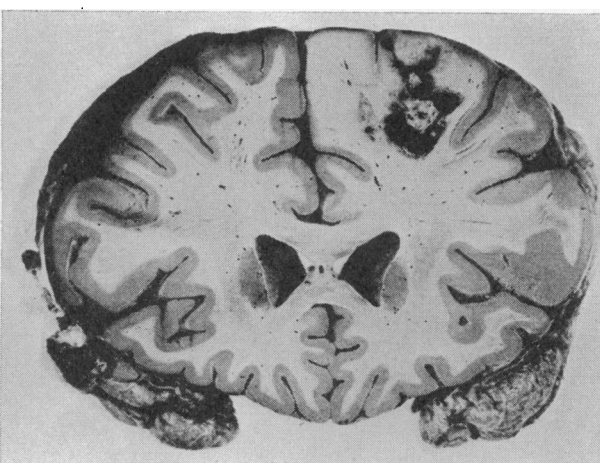


Fig. 2

Fig. 2 (Case 1).—Coronal section of brain through anterior horns of lateral ventricles. The tumor, cysts, and softened brain are shown in the upper medial portion of the left frontal lobe. Although the neurologic examination and the encephalogram did not localize the tumor, it is possible that the quantitative methods now available would have disclosed its position.

an excellent record of abnormal eye movements, and allows a fine analysis of nystagmus.*

PAIN

The algometer is used to determine, in grams of weight, the pressure necessary to cause pain or to produce the sensation of sticking. Head and Holmes¹⁰ described such an instrument. The scale reads from 0 to 10 grams. Of course, the comparison between the two sides is of greater significance than between the result and the known average value.

TOUCH

In the same way, the esthesiometer measures, in milligrams, the lightest pressure that can be felt. A simple model now in use by the author (Fig. 3) produces pressure of from 10 to 300 milligrams. A pressure of 10 milligrams can seldom be felt on the palm or finger-tips.

Thompson²² utilized a lever falling through a measured distance and determined, as well, the necessary duration of the stimulus.

The earliest and most widely used method is that of von Frey,⁷ in which hairs of different diameters are used. The result is expressed in milligrams per millimeter radius of hair.

TASTE

When an electrode is touched to the tongue and a direct current passed through, the production of

* This instrument, called an ophthalmograph, is distributed by the American Optical Company.

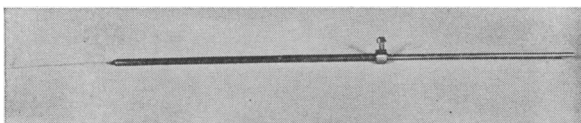


Fig. 3

Fig. 3.—A simple esthesiometer, consisting of a fine wire, monel metal, 0.004 inch in diameter, attached to the end of a rod. By sliding the sheath, the length of exposed wire and the pressure it exerts are varied. Graduations on the rod correspond to pressures at the end of the wire of from 10 to 300 milligrams.

an acid taste normally occurs at the cathode. The smallest current that will do this affords a measure of the sensitivity of taste. While not giving an absolute figure, it enables the two sides of the tongue to be compared quantitatively, or the same side to be observed from time to time.

VESTIBULAR SENSE

The generally used vestibular tests have a quantitative value when the amount of fluid necessary to produce a response, its rate of flow and its temperature are measured. Electrical stimulation has been carried out and popularized by Blonder and Davis,² who found that normally a response should be obtained, using from 0.5 to 2.0 milliamperes of current, when the subject falls toward the anode or away from the cathode. The individual canals cannot be tested in this way, but the two sides can be tested separately.

SENSATION

Two-point discrimination is, *per se*, a quantitative method. Stereognosis does not lend itself to measurement.

To evaluate texture appreciation, Ruch²⁰ used grades of emery paper from 000 to 3.0 and then a grater, providing ten degrees of roughness.

Vibratory sensation is tested quantitatively by Newman, Doupe, and Wilkins.¹⁵ They use the method as previously outlined by von Bogh,⁸ Sitzepfand,²¹ and Hugony.¹² In it, the pole-piece of an electromagnet is caused to vibrate by passing an alternating current through the coil. The frequency, voltage, and current used are measured. Thus the beat frequency and the strength of stimulus can be controlled and measured. Both heavy and light contact with the skin are tested. A standard frequency of 200 cycles per second was found to be best, varying only the strength of stimulus.

Head and Holmes^{9,10} described a simple instrument to evaluate position sense. A movement of the fingers through one degree was normally perceived.

For testing temperature sensation, Dallenbach⁴ outlined a simple instrument in which the temperature and pressure against the skin, as well as the area of contact, are controlled. Lanier¹⁴ described a simpler instrument and a very convenient one.

To evaluate the sense of weight, Head and Holmes¹⁰ tested the patient with weights placed on the supported hand and on the unsupported hand, and by having him heft different weights.

MOTOR SYSTEM

In a recent article by Holmes,¹¹ graphic records are shown of simple movements, movement against resistance, tremor, range of movement, compound movement, postural fixation, movements involving change in direction, and rapidly alternating movements.

In recording Rombergism, a short pencil on a circular base is strapped on the vertex. A light board holding a sheet of paper is allowed to rest on the pencil point, and the path of the head is thus obtained.

Kolb and Kleyntjens¹³ studied respiratory movements, by graphic methods, in patients with hemiplegia and found a difference between the quiet involuntary movements and the forced voluntary movements. Both types of movement were characteristically altered on the abnormal side.

Many investigators have worked on myograms and on the reaction time. It has been well demonstrated that graphic records of muscle responses give much more information than can be caught by the eye of an observer. Pritchard¹⁶ has shown that early spasticity alters the contraction curve in a characteristic way before reflex changes are evident to the eye.

Electromyographic studies yield further information regarding muscle contraction and reflex action. Pritchard^{17,18} and Lindsley¹⁹ have reported extensively on this subject.

ELECTRO-ENCEPHALOGRAPH

The electro-encephalograph is not an instrument that can be applied as an adjunct to every neurologic examination. It should be mentioned, however, in any account of scientific methods of use in intracranial diagnosis. A great variety of controlled experiments and of clinical results has been reported, and already certain abnormalities in the tracings have been given fairly definite significance. Williams and Gibbs³ provide a clear description of the method as it is now applied.

MENTAL STATUS

Gantt⁸ has reported a relatively simple electrical apparatus that allows one to reach a figure representing certain aspects of mental behavior. Naturally, the results are of only comparative value.

SUMMARY

Many parts of the neurologic examination can be carried out quantitatively and graphically.

Several methods, not in general use, are touched upon.

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VENEREAL LYMPHOGRANULOMA: PUBLIC HEALTH ASPECTS

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AS a problem in public health and because venereal lymphogranuloma is not generally recognized, we feel justified in presenting a brief résumé of the salient features of the subject. Although this disease is reportable under the new Venereal Disease Act (Assembly Bill No. 2790,